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THE PINK BOLLWORM.

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INTRODUCTION.

Considerable attention has recently been attracted to the pink bollworm (*Gelechia gossypiella* Saund.) (fig. 1) on account of the possibility of its introduction into the United States. This statement has been prepared to make available such general information as has been called for from time to time by planters and manufacturers.

As is well known, many of the most injurious insect pests of the United States have been imported from foreign countries. There seems no doubt that the pink bollworm would be able likewise to establish itself if it were introduced. It would be very likely to add greatly to the damage sustained by the cotton crop of this country from



FIG. 1.—Pink bollworm (*Gelechia gossypiella*): Full-grown larva, lateral view. Much enlarged. (Original.)

insects, which now amounts to about fifty millions of dollars per annum. That the introduction of the insect is easily possible is due to certain features of its life history which will be described later. As a matter of fact, in 1912 a shipment of 500 pounds of Egyptian cotton seed which was heavily infested by the pink bollworm reached Arizona. On account of the effective control law in that State and the watchfulness of Dr. A. W. Morrill, the State entomologist, the whole shipment was destroyed by fire. Otherwise it is extremely probable that a new and very destructive cotton insect would have been introduced. This would have been particularly unfortunate

NOTE.—This circular gives information about an insect that damages cotton crops and whose importation into this country is to be guarded against. It is of especial interest to both cotton growers and manufacturers.

in Arizona, on account of the comparative freedom of the cotton grown there from insect injury and the definite indication that the State will soon be able to produce large quantities of cotton of superior quality which can not be grown in other parts of the country.

On July 1, 1913, the Federal Horticultural Board promulgated a quarantine against cotton seed from all foreign countries, with the object of preventing the invasion of the pink bollworm. Since this quarantine has been in effect several shipments of cotton seed have been intercepted. All were found to be infested by the pink bollworm; one shipment, which was to be forwarded to Arizona, showed an infestation of 20 per cent.

In this connection it may be stated that there is no longer any need for importing cotton seed from Egypt, since there is an ample supply of

well-selected and acclimatized seed available in Arizona.

DISTRIBUTION.

The pink bollworm was described originally from India in 1843. Since that time it has been found more or less generally widespread in India, Ceylon, Burma, Straits Settlements, Egypt,

British East Africa, German East Africa, Nigeria, Sierra Leone, and the Hawaiian Islands. In the Hawaiian Islands it was undoubtedly introduced in cotton seed from India. There is also a doubtful record of the occurrence of the species in Japan.

The question has been raised as to whether the pink bollworm is not already established in the United States. For several reasons it seems certain that this is not the case. Since the boll weevil invaded the country planters have paid very especial attention to the insects found on the cotton plant. Each year hundreds of specimens mistaken for the boll weevil are sent to the Department of Agriculture and to State entomologists. Since the pink bollworm might easily be mistaken for the boll weevil by planters it is altogether likely that it would have been found if it were established at any point in the United States. Moreover, the chances of introduction have been small until recently, because the Egyptian crop has not been generally infested until within the last few years.



FIG. 2.—Seeds of Egyptian cotton showing typical injuries made by the pink bollworm. Much enlarged. (Original.)

HOW THE INSECT SPREADS.

The moth which is the parent of the pink bollworm is a fragile insect and can fly no great distance. If the spread of the species depended upon the flight of the adult its dispersion into new regions would be very slow. However, the fact that the immature stages occur in cotton seed, furnishes a ready means of artificial spread over great distances. (See fig. 2.) In Egypt experiments have shown that the larvæ may live within the cotton seed for as long as seven months. This would allow the insect to be transported to the most remote quarters of the earth. It is altogether likely that the original home of the species was in Asia and that various parts of Africa have become infested by shipments of seed from that country, as was the case in the Hawaiian Islands.

OCCURRENCE OF INFESTED SEED IN BALED COTTON.

During the course of the investigation of the possible introduction of the pink bollworm into the United States it was found that a considerable number of seeds are to be found in the bales of Egyptian cotton. It appears that a certain number of seeds pass around the ends of the rollers in the gins, and some may pass between the roller and the knife through small openings due to wear. When the possibility of the introduction of the pink bollworm, in seeds in bales of lint, came to attention an investigation was made in certain mills in New England and the South where Egyptian cotton is used. The picker waste from 37 bales was obtained and examined carefully. The number of seed recovered varied from 27 to 600 per bale, the average per bale being 215. It was noticed that the number of seed found in the picker waste depended upon the grade of the cotton—the lower grades having many more seeds than the better ones.

In the seed recovered from the picker waste of 37 bales 15 dead pink bollworms and 1 live one were found. The great majority of the seed appeared to be uninjured by the compression of the cotton. Baled cotton is therefore dangerous and the danger, of course, is greatest in the case of mills located in the cotton belt where cotton fields are frequently in close proximity. (See fig. 3.)

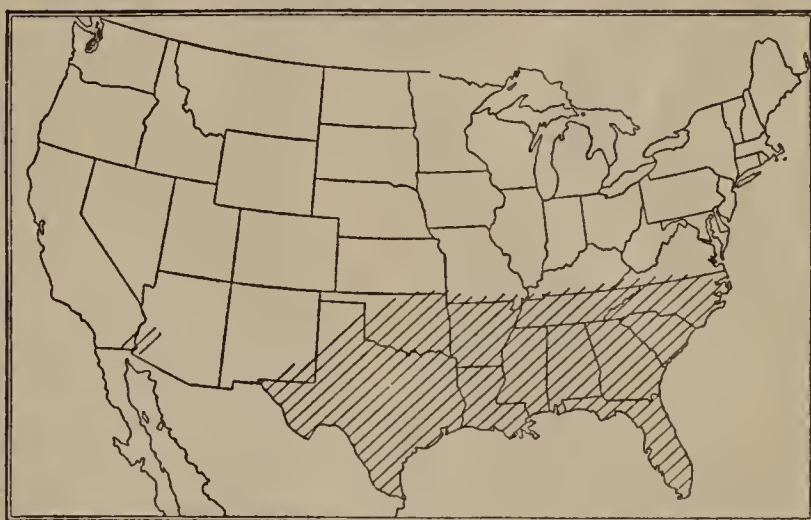


FIG. 3.—The cotton belt of the United States, from which all shipments of Egyptian cotton seed are excluded by quarantine. (Original.)

If the findings from the examination of the 37 bales to which reference has been made are used as a criterion it appears that over 16,000 live larvæ of the pink bollworm are brought to the United States each year and that 292 are sent to the southern mills.

HOW THE INSECT INJURES THE COTTON.

The pink bollworm affects the production of cotton in several ways. First, a considerable number of squares and bolls are so injured that they fall to the ground. In cases of heavy infestation 50 per cent of the crop may be destroyed in this way. However, this loss does not end with the falling off of a certain amount of the fruit.

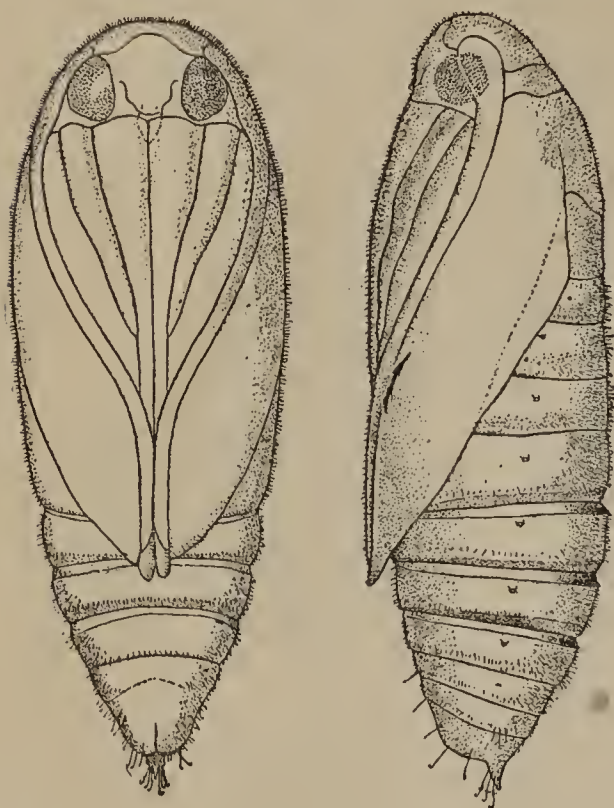


FIG. 4.—Pink bollworm: Pupa, ventral and lateral views. Much enlarged. (Original.)

A single lock of a boll may be infested. In such a case the remaining locks develop but the boll opens prematurely, and the fiber is short and kinky. Thus the grade of the cotton produced may be affected materially. Moreover, the work of the insect leaves stains in the fiber which also reduce the value of the product. This is not of great importance in the case of certain Egyptian varieties which produce dark-colored lint, but in the varieties producing white lint, like the Abassi, and the American upland and Sea Island varieties, this form of injury would be important.

A further form of injury by the pink bollworm is in relation to the seed.

Considerable attention was attracted in England during 1913 to the low yield in oil from the Egyptian seed which is milled in large quantities in that country. It was found that the lessened amount of oil expressed was due to the infestation of the seeds by this insect.

While the mills ordinarily obtain from 19 to 20 per cent of oil, the amount obtained in 1913 was found to be reduced to from 16 to 17 per cent. Another form of loss due to the attack of the insect against the seed is the reduction in the percentage of germination. In many cases the infestation must be so high that at least double the usual quantity of cotton seed must be planted to obtain a stand.

The total amount of loss produced by the pink bollworm in any community does not seem to have been determined. In practically all countries where the pink bollworm occurs it is associated with other species of insects which work in the bolls and squares of the cotton plant, and the relative damage by these different insects can

not be estimated. Wherever the pest is found, however, it is considered to be an insect of great importance. In Egypt in 1913, according to Gough and Storey,¹ the pink bollworm did more damage than all other cotton pests combined. In the Hawaiian Islands, where the pest was introduced within the last few years, it has spread rapidly and has become by far the most important enemy of cotton.

FOOD PLANTS.

It is quite evident from the accounts given by different writers that all varieties of cotton are attacked by the pink bollworm. Careful experiments conducted in India failed to reveal even the slightest indications of varietal resistance to the bollworm. It is therefore practically certain that if introduced into this country it would attack the Sea Island as well as all of the upland strains of American cotton.

Occasionally the pink bollworm appears to attack other plants. In the Hawaiian Islands, Fullaway reared it from *Thespesia populnea*. In Egypt, Dudgeon² records "til" (a species of *Sesamia*) and pomegranates as occasional food plants.

LIFE HISTORY.

The eggs of the moth of the pink bollworm, which hatch in about 10 days, are deposited singly on various parts of the cotton plant. The minute larvæ feed on the leaf surface for a short time but very soon penetrate to the interior of the cotton bolls, or "squares." The insect spends about 20 days in this stage, becoming in its mature larval form (fig. 1) about half an inch long. The general color is pink, from which the popular name is derived. In this stage it feeds largely upon the seeds, and when ready to transform to the pupa occupies the hull from which the kernel has been devoured. In examining Egyptian cotton received in this country the larvæ were frequently found to have caused two seeds to adhere closely together. In fact it seems to be a definite habit of the larva in the last stage to form a cell of two hulls. This, however, does not seem to be an inva-



FIG. 5.—Pink bollworm: Moth, or adult, dorsal view. Much enlarged. (Original.)

¹ Methods for the destruction of the pink bollworm in cotton seed. Ministry of cotton culture, Cairo, 1914, p. 1.

² Agricultural Journal of Egypt, vol. 2, pt. 2, 1913, p. 4.

riable rule, as pupæ (fig. 4) have sometimes been found in the lint. The pupal stage lasts for about 14 days, after which the insect changes to a moth.

DESCRIPTION.

The moth (fig. 5) of the pink bollworm is about three-fourths of an inch in expanse, and the general color grayish brown with darker blotches. One of the characteristic markings is a large dark area near the apex of the forewings, whereas the hind wings are of a uniform grayish color. In this stage the insect lives at least 10 days, probably considerably longer, and begins the deposition of eggs in three or four days after it emerges from the chrysalis.





